PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-284480

(43)Date of publication of application : 31.10.1995

(51)Int.CI. A61B 5/022
A61B 5/0205
A61B 5/0245

(21)Application number : 06-214425

(22)Date of filing : 08.09.1994

(30)Priority

Priority number : 06 28164　Priority date : 25.02.1994　Priority country : JP

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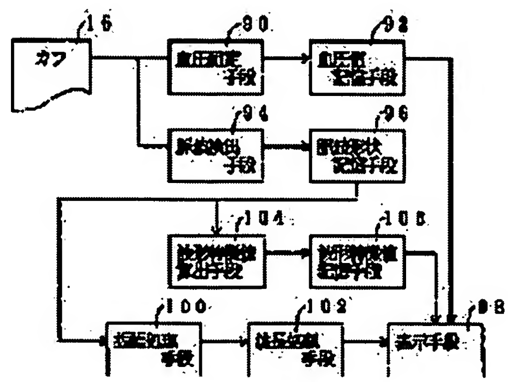
(54) BLOOD PRESSURE MEASURING DEVICE

(57)Abstract:



PURPOSE: To provide a blood pressure measuring device capable of measuring blood pressure in a relatively easy mananer and capable of easily grasping the change of the shape of a pulse wave capable of judging a cardiac trouble at the time of the measurement of blood pressure.

CONSTITUTION: In a process measuring the blood pressure value of a living body, the pulse wave generated from the artery of the living body in synchronous relation to a heartbeat is detected by a pulse wave detection means 94 and the shape of the pulse wave detected by the pulse wave detection means 94 is successively stored in a pulse wave shape memory means 96 at each time when blood pressure is measured by a blood pressure measuring means 90. Whereupon, the blood pressure value stored in the

blood pressure value memory means 92 is displayed on a display means 98 according to measuring order and the curve showing the shape of a pulse wave successively stored in the pulse wave shape memory means 96 is respectively displayed in parallel according to the memory order. The shape of a pulse wave is displayed in a parallelly arranged state by relatively simple blood pressure measuring operation and the transition of the change of the shape of a pulse wave can be easily grasped along with the transition of a blood pressure value and, therefore, a cardiac trouble can be judged.

LEGAL STATUS

[Date of request for examination]	*12.06.2001*
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	*3464052*
[Date of registration]	*22.08.2003*
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号

特開平7－284480

(43)公開日　平成７年(1995)10月31日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ａ６１Ｂ　5/022				
5/0205				
5/0245				
		7638－4Ｃ	Ａ６１Ｂ　5/ 02	３３８　Ａ
		7638－4Ｃ		Ｄ

審査請求　未請求　請求項の数７　ＯＬ　（全　９　頁）　最終頁に続く

(21)出願番号　特願平6－214425

(22)出願日　平成６年(1994) ９月８日

(31)優先権主張番号　特願平6－28164

(32)優先日　平６(1994) ２月25日

(33)優先権主張国　日本（ＪＰ）

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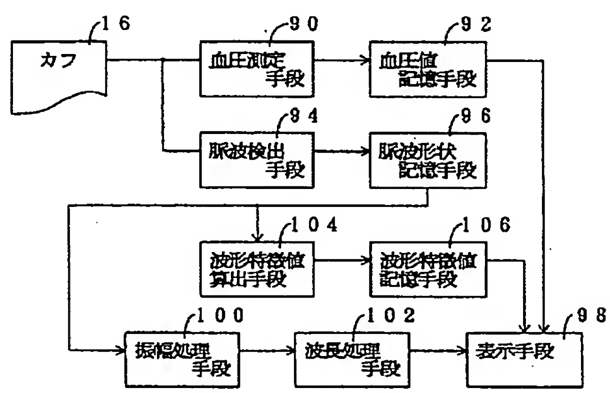
(54)【発明の名称】　血圧測定装置

(57)【要約】

【目的】　比較的測定が容易である血圧測定時において心疾患の判断が可能な脈波形状の変化が容易に把握できる血圧測定装置を提供する。

【構成】　生体の血圧値が測定される過程でその生体の動脈から心拍に同期して発生する脈波が脈波検出手段９４により検出され、その脈波検出手段９４により検出された脈波の形状が血圧測定手段９０による血圧測定毎に脈波形状記憶手段９６により順次記憶されると、表示手段９８により、血圧値記憶手段９２により記憶された血圧値がその測定順序に従って表示されるとともに、脈波形状記憶手段９６により順次記憶された脈波の形状を表す曲線１２２がその記憶順序に従って並列的にそれぞれ表示される。比較的測定が簡便な血圧測定操作によって、脈波の形状が並列的に配列された状態で表示されることから、脈波の形状の変化の推移が血圧値の推移と共に容易に把握できるので、心疾患の判断が可能となる。



過程でその生体の動脈から心拍に同期して発生する脈波が脈波検出手段により検出され、その脈波検出手段により検出された脈波の形状が血圧測定手段による血圧測定毎に脈波形状記憶手段により順次記憶されると、表示手段により、血圧値記憶手段により記憶された血圧値がその測定順序に従って表示されるとともに、脈波形状記憶手段により順次記憶された脈波の形状を表す曲線がその記憶順序に従って並列的にそれぞれ表示される。

【０００８】

【発明の効果】したがって、本発明の血圧測定装置によれば、比較的測定が簡便な血圧測定操作によって、脈波の形状が並列的に配列された状態で表示されることから、脈波の形状の変化の推移が血圧値の推移と共に容易に把握できるので、心疾患の判断が可能となる。

【０００９】ここで、好適には、前記脈波検出手段は、前記血圧測定手段が血圧値を測定するために生体に巻回されるカフに心拍に同期して発生する圧力振動を脈波として検出するものである。このようにすれば、脈波の形状を検出するための脈波センサを独立に設ける必要がないので、装置の構造が単純となり且つ安価に構成できる利点がある。

【００１０】また、好適には、(d) 前記表示手段により表示される脈波の振幅を均等とするために、前記脈波形状記憶手段により記憶された脈波をその振幅が同一となるように信号処理を行う振幅処理手段がさらに含まれる。このようにすれば、脈波形状の比較が容易となり、脈波形状の変化を簡単に把握できる利点がある。

【００１１】また、好適には、(e) 前記表示手段により表示される脈波の波長を均等とするために、前記脈波形状記憶手段により記憶された脈波をその波長が同一となるように信号処理を行う波長処理手段がさらに含まれる。このようにすれば、脈波形状の比較が容易となり、脈波形状の変化を簡単に把握できる利点がある。

【００１２】また、好適には、(d) 前記表示手段により表示される脈波の振幅を均等とするために、前記脈波形状記憶手段により記憶された脈波をその振幅が同一となるように信号処理を行う振幅処理手段と、(e) 前記表示手段により表示される脈波の波長を均等とするために、前記脈波形状記憶手段により記憶された脈波をその波長が同一となるように信号処理を行う波長処理手段とが共に含まれる。このようにすれば、一層、脈波形状の比較が容易となり、脈波形状の変化を簡単に把握できる利点がある。

【００１３】また、好適には、(f) 前記脈波形状記憶手段により順次記憶された脈波の波形特徴値を算出する波形特徴値算出手段と、(g) その脈波の波形特徴値を順次記憶する波形特徴値記憶手段とが更に備えられ、前記表示手段は、その波形特徴値記憶手段により順次記憶された脈波の波形特徴値を、その脈波の検出順序に従って表示するように構成される。このようにすれば、波形の変化が定量的に把握され、一層、脈波形状の変化が容易に把握される利点がある。

【００１４】また、好適には、前記表示手段は、前記血圧値記憶手段によりそれぞれ記憶された血圧値、前記波形特徴値記憶手段によりそれぞれ記憶された脈波の波形特徴値を、共通の時間軸に沿ってグラフ表示するとともに、前記脈波形状記憶手段により記憶された脈波の形状を表す曲線を上記共通の時間軸に沿って並列的に表示するように構成される。このようにすれば、血圧値および脈波の波形特徴値が脈波形状と共に共通の時間軸に沿って表示されるので、脈波形状の変化の把握が一層容易となる。

【００１５】

【実施例】以下、本発明の一実施例を図面に基づいて詳細に説明する。

【００１６】図１は、本発明の一実施例の自動血圧測定装置８を示す斜視図である。図において、箱体１０には、被測定者の腕１２を差し込むための貫通穴１４が設けられており、その貫通穴１４内には、袋状の可撓性布およびゴム袋から成るカフ１６を内周面に備えて円筒状に保持されたベルト１８が配設されている。箱体１０の操作パネル２０には、起動スイッチ２２、停止スイッチ２４、プリンタ２６、カード挿入口２８などが配設され、表示パネル３０には、最高血圧表示器３２、最低血圧表示器３４、脈拍数表示器３６、時刻表示器３８がそれぞれ配設されている。

【００１７】図２は、上記自動血圧測定装置８の回路構成を説明するブロック線図である。図において、カフ１６は、圧力センサ４２、排気制御弁４４、および空気ポンプ４６と配管４８を介して接続されており、そのカフ１６を内周面に備えて円筒状に巻回されたベルト１８の一端は固定され且つ他端は減速機付ＤＣモータ５０により駆動されるドラム５２により引き締められるようになっている。圧力センサ４２の出力信号はバンドパスフィルタ５４により弁別され、脈拍に同期して発生するカフの圧力振動である脈波信号ＳＭが演算制御回路５６のＡ／Ｄ変換器５８に供給される。また、圧力センサ４２の出力信号はローパスフィルタ６０により弁別され、カフ１６の静圧を表すカフ圧信号ＳＫが演算制御回路５６のＡ／Ｄ変換器５８に供給される。

【００１８】上記演算制御回路５６は、ＣＰＵ６２、ＲＯＭ６４、ＲＡＭ６６、入力インターフェース回路６８、出力インターフェース回路７０などを備えたマイクロコンピュータである。ＣＰＵ６２は、ＲＡＭ６６の一時記憶機能を利用しつつ予めＲＯＭ６４に記憶された手順に従って入力信号を処理して駆動信号や表示信号などを出力する。すなわち、血圧測定に際しては、ＣＰＵ６２は、予め定められた手順にしたがって減速機付ＤＣモータ５０を駆動することによりカフ１６を生体の上腕部に巻回し、空気ポンプ４６を駆動することによりカフ１

の発生間隔に基づいて脈拍数が算出される。

【００２９】次いでステップＳ６では、測定された上記最高血圧値ＳＡＰ、最低血圧値ＤＡＰ、平均血圧値ＭＡＰ、脈拍数と測定日時とが前記血圧値記憶手段９２として機能する血圧値記憶領域８７内において被測定者毎に記憶されるとともに最高血圧表示器３２、最低血圧表示器３４、脈拍数表示器３６にそれぞれ表示される。

【００３０】次いで、ステップＳ７では、上記ステップＳ５において血圧測定のために採取された脈波のうち、カフ１６の圧力が予め設定された圧力値または圧力範囲内で発生した脈波の形状が、前記脈波形状記憶手段９６として機能する脈波形状記憶領域８８において被測定者毎に測定日と共に記憶される。この予め設定された圧力は、平均血圧値付近或いはそれ以下の値、より好ましくは最低血圧値と平均血圧値との間の圧力のうちのより低い側の圧力が選択される。たとえば、最低血圧値と平均血圧値との間で発生した脈波のうちの最低血圧値に最も近い圧力で発生した脈波の形状が記憶される。なお、上記脈波はバンドパスフィルタ５４から出力されたものであり、本実施例ではこのバンドパスフィルタ５４が脈波検出手段９４として機能している。

【００３１】次いで、前記波形特徴値算出手段１０４に対応するステップＳ８が実行されることにより、上記脈波形状記憶領域８８に記憶された脈波の形状の波形特徴値が算出される。この波形特徴値とは、たとえば脈波の立ち上がり部分の傾斜に関連するスロープ値ＳＬＯＰＥ、脈波の立ち下がり部分の傾斜に関連する％ＭＡＰ値である。上記スロープ値ＳＬＯＰＥは、脈波の立ち上がり部分の微分値の最大値（ｄＰ／ｄｔ）$_{max}$ として定義されるものであり、脈波形状記憶領域８８において被測定者毎に記憶された脈波の形状データから算出される。また、上記％ＭＡＰ値は、図５に示すように、脈波形状における振幅値ｂすなわち脈圧（＝ＳＡＰ－ＤＡＰ）に対する平均血圧値ＭＡＰ（脈波面積の重心位置）の高さａ（＝ＭＡＰ－ＤＡＰ）の割合（＝１００×ａ／ｂ）として定義される。上記スロープ値ＳＬＯＰＥは、心筋の強さに比例するものであって、心拍出量に関連する値である。また、上記％ＭＡＰ値は、血管の弛緩状態すなわち末梢血管抵抗に関連する値である。

【００３２】続くステップＳ９では、上記ステップＳ８において算出された波形特徴値、すなわちスロープ値ＳＬＯＰＥおよび％ＭＡＰ値が、前記波形特徴値記憶手段１０６として機能する波形特徴値記憶領域８９において被測定者毎に測定日と共に記憶される。次いで、前記振幅処理手段１００に対応するステップＳ１０において、脈波形状記憶領域８８に記憶された脈波の形状がその振幅が予め設定された値となるように修正される。脈波振幅は測定時の血圧値によって大きな影響を受けることから、並列表示を容易として脈波形状の変化を把握し易くするためである。また、前記波長処理手段１０２に対応するステップＳ１１では、上記振幅処理が施された脈波形状がその波長が予め設定された値となるように修正される。脈波の波長は測定時の脈拍数によって大きな影響を受けることから、並列表示を容易として脈波形状の変化を把握し易くするためである。

【００３３】そして、前記表示手段９８に対応するステップＳ１２では、たとえば図６に示すように、プリンタ２６により記録紙１１０上に表示出力される。すなわち、記録紙１１０上の左上の位置には被測定者の氏名１１２が表示されるとともに、その下側には、測定日時、血圧値、および脈拍数のリスト１１４、トレンドグラフ１１６、脈波列１１８が順次表示される。このトレンドグラフ１１６では、最高血圧値および最低血圧値を上端および下端それぞれに示す棒線と脈拍数を示す△印と％ＭＡＰ値を示す●印とＳＬＯＰＥ値を示す○印とが血圧測定時点に対応して横軸すなわち時間軸１２０に沿って表示されている。また、上記脈波列１１８では、各血圧測定時において順次記憶された脈波の形状１２２が時間軸１２０およびそれに平行な時間軸１２４に沿って並列的に表示されている。

【００３４】上述のように、本実施例によれば、生体の血圧値が測定される過程でその生体の動脈から心拍に同期して発生する脈波がバンドパスフィルタ５４により検出され、そのバンドパスフィルタ５４により検出された脈波の形状がステップＳ５による血圧測定毎に脈波形状記憶領域８８により順次記憶されると、ステップＳ１２により、血圧値記憶領域８７により記憶された血圧値がその測定順序に従って表示されるとともに、脈波形状記憶領域８８により順次記憶された脈波の形状を表す曲線１２２がその記憶順序に従って並列的にそれぞれ表示される。したがって、本実施例の装置によれば、比較的測定が簡便な血圧測定操作によって、脈波の形状が並列的に配列された状態で表示されることから、脈波の形状の変化の推移が血圧値の推移と共に容易に把握できるので、心疾患の判断が可能となる。

【００３５】また、本実施例によれば、前記脈波検出手段９４として機能するバンドパスフィルタ５４は、血圧測定のために前記カフ１６に生体の心拍に同期して発生する圧力振動を脈波として検出するものであるので、脈波の形状を検出するための脈波センサを独立に設ける必要がないので、装置の構造が単純となり且つ安価に構成できる利点がある。

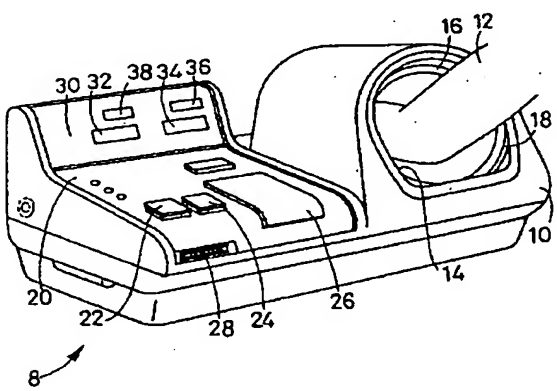
【００３６】また、本実施例によれば、表示手段９８により表示される脈波形状１２２の振幅を均等とするために、脈波形状記憶領域８８により記憶された脈波が、ステップＳ１０によりその振幅が同一となるように信号処理される。これにより、脈波形状の比較が容易となり、脈波形状の変化を簡単に把握できる。

【００３７】また、本実施例によれば、上記表示手段９８により表示される脈波１２２の波長を均等とするため

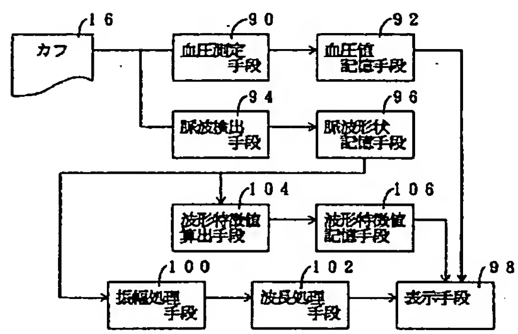
【図２】図１の実施例の回路構成を説明するブロック線図である。
【図３】図１の演算制御回路の制御機能を説明する機能ブロック線図である。
【図４】図１の演算制御回路の制御作動を説明するフローチャートである。
【図５】図４のフローチャートにおいて求められる脈波の形状特徴値である％ＭＡＰを説明する図である。
【図６】図４の制御作動に従って表示出力される例を説明する図である。
【図７】本発明の他の実施例における表示出力例を説明する図である。
【図８】本発明の更に他の実施例における表示出力例を説明する図である。

【符号の説明】
８：自動血圧測定装置
１６：カフ
９０：血圧測定手段
９２：血圧値記憶手段
９４：脈波検出手段
９６：脈波形状記憶手段
９８：表示手段
１００：振幅処理手段
１０２：波長処理手段
１０４：波形特徴値算出手段
１０６：波形特徴値記憶手段

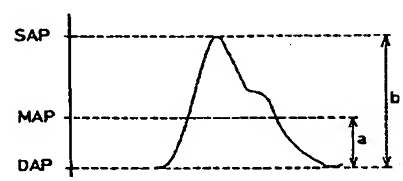
【図１】



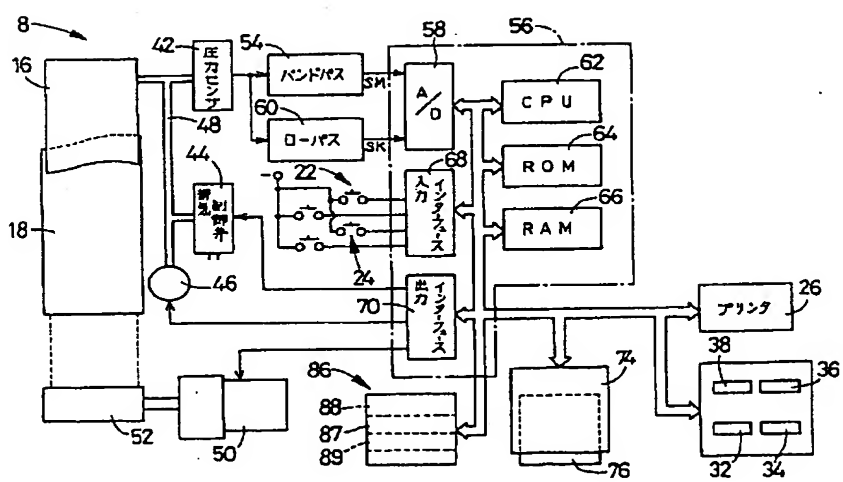
【図３】



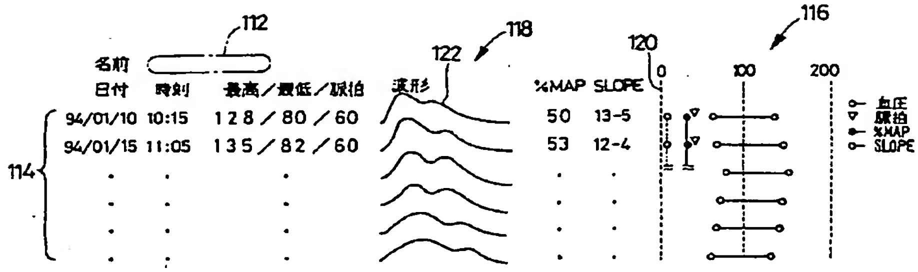
【図５】



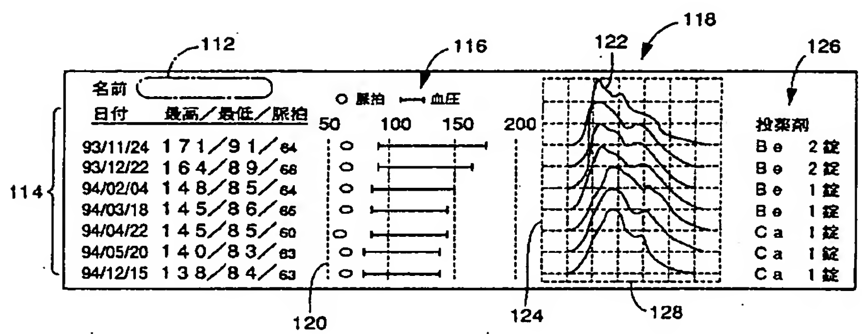
【図２】



【図７】



【図８】



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(51)Int.Cl.[6]	識別記号	庁内整理番号	F I		技術表示箇所
		7638－4C	A61B　5/02	310　Z	

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates the pulse wave configuration at the time of the blood-pressure value acquired by the blood pressure measurement of multiple times, or its blood pressure measurement to the blood-pressure-measurement equipment which can be displayed according to the measurement sequence.
[0002]
[Description of the Prior Art] While a blood-pressure value is memorized for every blood pressure measurement, the blood-pressure-measurement equipment which carries out graphical representation of the memorized blood-pressure value according to the measurement sequence is known. For example, the automatic blood-pressure-measurement equipment indicated by JP,5-137698,A is it. Since transition of the measured blood-pressure value may be grasped easily according to such automatic blood-pressure-measurement equipment, there is an advantage which can judge a living body's health condition correctly.
[0003] By the way, the slight fit that a breast is painful cannot carry out recognition that a serious heart disease may be inherent from the transient thing, in many cases. Moreover, by there being no subjective sign in any way then, even if it recognizes and receives a diagnosis of a doctor once, since it is a healthy body apparently, a diagnosis may be performed by the inspection data of blood-pressure-measurement extent.
[0004]
[Problem(s) to be Solved by the Invention] However, since self-decision or a diagnosis of the possibility of a heart disease cannot be performed at all even if blood pressure measurement is performed by said conventional automatic blood-pressure-measurement equipment to the above living bodies, and the measured blood-pressure value or its transition does not pass to be obtained but it is able to judge hypertensive possibility so then, when a living body maintains the usual life, there is a possibility of resulting in serious condition.
[0005] The place which succeeds in this invention against the background of the above situation, and is made into the purpose is to offer the blood-pressure-measurement equipment which change of the pulse wave configuration which can judge a heart disease can grasp easily at the time of blood pressure measurement with comparatively easy measurement.
[0006]
[Means for Solving the Problem] The place made into the summary of this invention for attaining this purpose It has a blood-pressure-measurement means to measure a living body's blood-pressure value, and a blood-pressure value storage means to memorize serially the blood-pressure value measured by the blood-pressure-measurement means. It is blood-pressure-measurement equipment which outputs the blood-pressure value memorized serially to the blood-pressure value storage means, and is (a). In the process in which a living body's blood-pressure value is measured by said blood-pressure-measurement means A pulse wave detection means to detect the pulse wave generated from the living body's artery

synchronizing with a heartbeat, (b) The pulse wave shape memory means which carries out the sequential storage of the configuration of the pulse wave detected by the pulse wave detection means for every blood pressure measurement by said blood-pressure-measurement means, (c) While displaying the blood-pressure value memorized by said blood-pressure value storage means according to the measurement sequence, it is in including a display means to display in juxtaposition the curve showing the configuration of the pulse wave by which sequential storage was carried out with said pulse wave shape memory means according to the storage sequence, respectively.

[0007]

[Function] If it does in this way, the pulse wave generated from the living body's artery in the process in which a living body's blood-pressure value is measured, synchronizing with a heartbeat will be detected by the pulse wave detection means. When the sequential storage of the configuration of the pulse wave detected by the pulse wave detection means is carried out by the pulse wave shape memory means for every blood pressure measurement by the blood-pressure-measurement means, with a display means While the blood-pressure value memorized by the blood-pressure value storage means is displayed according to the measurement sequence, the curve showing the configuration of the pulse wave by which sequential storage was carried out with the pulse wave shape memory means is displayed in juxtaposition according to the storage sequence, respectively.

[0008]

[Effect of the Invention] Therefore, since according to the blood-pressure-measurement equipment of this invention the configuration of a pulse wave is displayed in the condition of having been arranged in juxtaposition by the blood-pressure-measurement actuation with, comparatively simple measurement and transition of change of the configuration of a pulse wave can grasp easily with transition of a blood-pressure value, decision of a heart disease is attained.

[0009] Here, suitably, said pulse wave detection means detects pressure vibration generated in the cuff wound around a living body synchronizing with a heartbeat as a pulse wave, in order that said blood-pressure-measurement means may measure a blood-pressure value. If it does in this way, since it is not necessary to form independently the pulse wave sensor for detecting the configuration of a pulse wave, the structure of equipment becomes simple and there is an advantage which can be constituted cheaply.

[0010] Moreover, it is (d) suitably. In order to equalize the amplitude of the pulse wave displayed by said display means, an amplitude processing means to perform signal processing so that the amplitude may become the same about the pulse wave memorized by said pulse wave shape memory means is included further. If it does in this way, the comparison of a pulse wave configuration becomes easy and there is an advantage which can grasp change of a pulse wave configuration easily.

[0011] Moreover, it is (e) suitably. In order to equalize wavelength of the pulse wave displayed by said display means, a wavelength processing means to perform signal processing so that the wavelength may become the same about the pulse wave memorized by said pulse wave shape memory means is included further. If it does in this way, the comparison of a pulse wave configuration becomes easy and there is an advantage which can grasp change of a pulse wave configuration easily.

[0012] Moreover, it is (d) suitably. In order to equalize the amplitude of the pulse wave displayed by said display means An amplitude processing means to perform signal processing so that the amplitude may become the same about the pulse wave memorized by said pulse wave shape memory means, and (e) In order to equalize wavelength of the pulse wave displayed by said display means Both wavelength processing means to perform signal processing so that the wavelength may become the same about the pulse wave memorized by said pulse wave shape memory means are included. If it does in this way, comparing [of a pulse wave configuration] becomes still easier, and there is an advantage which can grasp change of a pulse wave configuration easily.

[0013] Moreover, it is (f) suitably. A wave description value calculation means to compute the wave description value of the pulse wave by which sequential storage was carried out with said pulse wave shape memory means, (g) It has further the wave description value storage means which carries out the sequential storage of the wave description value of the pulse wave, and said display means is constituted so that the wave description value of the pulse wave by which sequential storage was carried out with

the wave description value storage means may be displayed according to the detection sequence of the pulse wave. If it does in this way, a wave-like change is grasped quantitatively and there is an advantage as which change of a pulse wave configuration is grasped easily further.
[0014] Moreover, suitably, said display means is constituted so that the curve showing the configuration of the pulse wave memorized by said pulse wave shape memory means may be displayed in juxtaposition along with a time-axis common to the above, while carrying out graphical representation of the blood-pressure value memorized by said blood-pressure value storage means, respectively, and the wave description value of the pulse wave memorized by said wave description value storage means, respectively along with a common time-axis. If it does in this way, since a blood-pressure value and the wave description value of a pulse wave will be displayed along with a common time-axis with a pulse wave configuration, grasp of change of a pulse wave configuration becomes still easier.
[0015]
[Example] Hereafter, one example of this invention is explained to a detail based on a drawing.
[0016] Drawing 1 is the perspective view showing the automatic blood-pressure-measurement equipment 8 of one example of this invention. In drawing, the through hole 14 for inserting the arm 12 of an operating personnel-ed is formed in the box 10, and the belt 18 held in the shape of a cylinder in preparation for inner skin in the cuff 16 which consists of a saccate flexible cloth and a saccate rubber bladder is arranged in the through hole 14. A start switch 22, a safety switch 24, a printer 26, a card slot 28, etc. are arranged by the control panel 20 of a box 10, and the highest-blood-pressure drop 32, the lowest-blood-pressure drop 34, the pulse numeral machine 36, and the time stamp machine 38 are arranged by the display panel 30, respectively.
[0017] Drawing 2 is a block diagram explaining the circuitry of the above-mentioned automatic blood-pressure-measurement equipment 8. In drawing, the cuff 16 is connected with the pressure sensor 42, the exhaust air control valve 44, and the air pump 46 through piping 48, and the end of the belt 18 around which the cuff 16 was wound in the shape of a cylinder in preparation for inner skin is fixed, and the other end is tightened on the drum 52 driven with DC motor 50 with a reducer. It is discriminated from the output signal of a pressure sensor 42 with a band pass filter 54, and the pulse wave signal SM which is pressure vibration of the cuff generated synchronizing with a pulse is supplied to A/D converter 58 of a control unit 56. Moreover, it is discriminated from the output signal of a pressure sensor 42 with a low pass filter 60, and the cuff pressure signal SK showing the static pressure of a cuff 16 is supplied to A/D converter 58 of a control unit 56.
[0018] The above-mentioned control unit 56 is the microcomputer equipped with CPU62, ROM64, RAM66, the input interface circuitry 68, the output interface circuitry 70, etc. Using the temporary storage function of RAM66, it processes an input signal according to the procedure beforehand memorized by ROM64, and CPU62 outputs a driving signal, a status signal, etc. Blood pressure measurement is faced. Namely, CPU62 A cuff 16 in a living body's overarm section by driving DC motor 50 with a reducer according to the procedure defined beforehand Winding, The overarm section is pressed by the cuff 16 by driving an air pump 46. Subsequently, drive the exhaust air control valve 44 and the pressure of the compression pressure force of a cuff 16 is made to lower gradually. The blood-pressure value storage region 87 of storage 86 is made to carry out sequential storage at the same time an oscillograph metric method determines a blood-pressure value based on the pulse wave signal SM acquired in the **** pressure-lowering process, and the cuff pressure signal SK and it displays the blood-pressure value on drops 32 and 34. Moreover, CPU62 makes the pulse wave shape memory field 88 carry out the sequential storage of the configuration of the pulse wave in the fixed pressure set to less than [the pressure for example, a mean-blood-pressure value, defined beforehand or it] for every above-mentioned blood pressure measurement. Furthermore, CPU62 computes the wave description value of the configuration of the pulse wave, and the wave description value storage region 89 is made it to carry out sequential storage. The above-mentioned store 86 is constituted by the store good [a magnetic disk, a magnetic tape, volatile semiconductor memory, or / non-volatile] and known.
[0019] Moreover, while the above CPU 62 makes a printer 26 print the trend graph of the blood-pressure value by which sequential storage was carried out, and the wave description value to the above-

mentioned blood-pressure value storage region 87 and the wave description value storage region 89 and displays it on them for every blood pressure measurement For every blood pressure measurement, a printer 26 is made to print in juxtaposition the configuration of the pulse wave by which sequential storage was carried out along with the above-mentioned trend graph and a common time-axis to the above-mentioned pulse wave shape memory field 88, and it is displayed on it.

[0020] Drawing 3 is a functional block diagram explaining the control function of the above-mentioned control unit 56. In drawing, the blood-pressure value measured by the blood-pressure-measurement means 90 is serially memorized by the blood-pressure value storage means 92. The pulse wave detection means 94 is the process in which a blood-pressure value is measured by the blood-pressure-measurement means 90, and detects the pulse wave generated from a living body's artery synchronizing with a heartbeat. The pulse wave shape memory means 96 carries out the sequential storage of the configuration of the pulse wave detected by the pulse wave detection means 94 for every blood pressure measurement by the blood-pressure-measurement means 90. The display means 98 displays in juxtaposition the curve showing the configuration of the pulse wave by which sequential storage was carried out with the above-mentioned pulse wave shape memory means 96 according to the storage sequence while displaying the blood-pressure value memorized by the above-mentioned blood-pressure value storage means 92 according to the measurement sequence. Thus, since the configuration of a pulse wave is displayed in the condition of having been arranged in juxtaposition by the blood-pressure-measurement actuation with, comparatively simple measurement and transition of change of the configuration of a pulse wave can grasp easily with transition of a blood-pressure value, decision of a heart disease is attained.

[0021] Moreover, in order to equalize the amplitude of the pulse wave configuration displayed by the above-mentioned display means 98, an amplitude processing means 100 to perform signal processing so that the amplitude may become the same about the pulse wave memorized by the pulse wave shape memory means 96 is established. Thereby, the comparison of a pulse wave configuration becomes easy and can grasp change of a pulse wave configuration easily.

[0022] Moreover, in order to equalize wavelength of the pulse wave displayed by the above-mentioned display means 98, a wavelength processing means 102 to perform signal processing so that the wavelength may become the same about the pulse wave memorized by the pulse wave shape memory means 96 is established further. Thereby, the comparison of a pulse wave configuration becomes still easier, and there is an advantage which can grasp change of a pulse wave configuration easily.

[0023] Moreover, it has further a wave description value calculation means 104 to compute the wave description value of the pulse wave by which sequential storage was carried out with the pulse wave shape memory means 96, and the wave description value storage means 106 which carries out the sequential storage of the wave description value of the pulse wave. Said display means 98 displays the wave description value of the pulse wave by which sequential storage was carried out with the wave description value storage means 106 according to the detection sequence of the pulse wave. Thereby, a wave-like change is grasped quantitatively and change of a pulse wave configuration is grasped further easily.

[0024] Moreover, the above-mentioned display means 98 displays in juxtaposition the curve showing the configuration of the pulse wave memorized by the pulse wave shape memory means 96 along with a time-axis common to the above while carrying out graphical representation of the blood-pressure value by which sequential storage was carried out with the blood-pressure value storage means 92, and the wave description value of the pulse wave by which sequential storage was carried out with the wave description value storage means 106 along with a common time-axis. Thereby, since a blood-pressure value and the wave description value of a pulse wave are displayed along with a common time-axis with a pulse wave configuration, grasp of change of a pulse wave configuration becomes still easier.

[0025] Hereafter, the important section of actuation of the above-mentioned control unit 56 is explained according to the flow chart shown in drawing 4 .

[0026] At step S1 of drawing 4 , it is judged whether the magnetic card 76 was inserted in the magnetic-card insertion opening 28 of a card reader 74. When decision of this step S1 is denied, this routine is

terminated, but when affirmed, ID signal recorded on the magnetic card 76 in step S2 is read.
[0027] At continuing step S3, it is judged whether read ID signal is beforehand registered into the storage region of storage 86. When decision of this step S4 is denied, the below-mentioned step S12 is performed and a display output is performed by the printer 26 on the recording paper 110, but when ID signal recorded on such a magnetic card 76 has not been registered, it considers as the contents of a display of the purport which has not been registered.
[0028] It is judged whether in continuing step S4, the start switch 22 for blood pressure measurement was operated, and it is made to stand by, when decision of the above-mentioned step S3 is affirmed (i.e., when ID signal recorded on the magnetic card 76 is registered) until it is affirmed that this decision is denied. If decision of this step S4 is affirmed, the blood-pressure-measurement routine of step S5 corresponding to said blood-pressure-measurement means 90 will be performed, and a highest-blood-pressure value, a lowest-blood-pressure value, a mean-blood-pressure value, a pulse rate, etc. will be measured. By this blood-pressure-measurement routine, a cuff 16 is made to carry out a pressure up automatically according to the procedure defined beforehand, and a blood-pressure value is determined according to the oscillometric method well known in the pressure-lowering process of this cuff 16. That is, while the highest-blood-pressure value SAP and the lowest-blood-pressure value DAP are determined based on change of the magnitude of the extracted pulse wave and the cuff pressure at the time of the maximum amplitude of the pulse wave is determined as a mean-blood-pressure value MAP, a pulse rate is computed based on the recurrence interval of the pulse wave used for the blood-pressure value decision.
[0029] Subsequently, while the measured above-mentioned highest-blood-pressure value SAP, the lowest-blood-pressure value DAP, the mean-blood-pressure value MAP, a pulse rate, and measurement time are memorized for every operating personnel-ed in the blood-pressure value storage region 87 which functions as said blood-pressure value storage means 92, it is expressed in the highest-blood-pressure drop 32, the lowest-blood-pressure drop 34, and the pulse numeral vessel 36 as step S6, respectively.
[0030] Subsequently, at step S7, the configuration of the pulse wave generated in the pressure value to which the pressure of a cuff 16 was beforehand set among the pulse waves extracted in the above-mentioned step S5 for blood pressure measurement, or the pressure range is memorized with an assay date for every operating personnel-ed in the pulse wave shape memory field 88 which functions as said pulse wave shape memory means 96. this pressure set up beforehand -- near a mean-blood-pressure value or the value not more than it -- the pressure of the lower side of the pressures between a lowest-blood-pressure value and a mean-blood-pressure value is chosen more preferably. For example, the configuration of the pulse wave generated by the pressure nearest to the lowest-blood-pressure value of the pulse waves generated between the lowest-blood-pressure value and the mean-blood-pressure value is memorized. In addition, the above-mentioned pulse wave is outputted from a band pass filter 54, and this band pass filter 54 is functioning as a pulse wave detection means 94 in this example.
[0031] Subsequently, the wave description value of the configuration of the pulse wave memorized to the above-mentioned pulse wave shape memory field 88 is computed by performing step S8 corresponding to said wave description value calculation means 104. This wave description value is the slope value SLOPE relevant to the inclination of the standup part of a pulse wave, and a %MAP value relevant to the inclination of the falling part of a pulse wave. The above-mentioned slope value SLOPE is the maximum (dP/dt) max of the differential value of the standup part of a pulse wave. It defines by carrying out and is computed from the configuration data of the pulse wave memorized for every operating personnel-ed in the pulse wave shape memory field 88. moreover, height a (= MAP-DAP) of the amplitude value [in / as the above-mentioned %MAP value is shown in drawing 5 / a pulse wave configuration] (pulse wave centroids-of-areas location) b MAP, i.e., the mean-blood-pressure value over pulse pressure (= SAP-DAP), -- comparatively (=100xa/b) -- ****** -- it defines. The above-mentioned slope value SLOPE is a value relevant to a cardiac output in proportion to the strength of a myocardium. Moreover, the above-mentioned %MAP value is a value relevant to the relaxed state, i.e., the peripheral vascular resistance, of a blood vessel.

[0032] In continuing step S9, the wave description value SLOPE computed in the above-mentioned step S8, i.e., a slope value, and %MAP value are memorized with an assay date for every operating personnel-ed in the wave description value storage region 89 which functions as said wave description value storage means 106. Subsequently, in step S10 corresponding to said amplitude processing means 100, it is corrected so that the configuration of the pulse wave memorized to the pulse wave shape memory field 88 may serve as a value to which the amplitude was set beforehand. Since the pulse wave amplitude is influenced [big] with the blood-pressure value at the time of measurement, it is for making change of a pulse wave configuration easy to indicate it easy by juxtaposition and to grasp. Moreover, at step S11 corresponding to said wavelength processing means 102, it is corrected so that the pulse wave configuration to which the above-mentioned amplitude processing was performed may serve as a value to which the wavelength was set beforehand. Since the wavelength of a pulse wave is influenced [big] with the pulse rate at the time of measurement, it is for making change of a pulse wave configuration easy to indicate it easy by juxtaposition and to grasp.

[0033] And at step S12 corresponding to said display means 98, as shown, for example in drawing 6 , a display output is carried out on the recording paper 110 by the printer 26. That is, while the name 112 of an operating personnel-ed is displayed on the location of the upper left on the recording paper 110, a sequential indication of the list 114 of measurement time, a blood-pressure value, and pulse rates, the trend graph 116, and the pulse wave train 118 is given at the bottom. In this trend graph 116, O mark which shows - mark which shows delta mark which shows the bar line which shows a highest-blood-pressure value and a lowest-blood-pressure value to upper limit and each lower limit, and a pulse rate, and %MAP value, and a SLOPE value is displayed in accordance with the axis of abscissa 120, i.e., a time-axis, corresponding to the blood-pressure-measurement time. Moreover, in the above-mentioned pulse wave train 118, the configuration 122 of the pulse wave by which sequential storage was carried out at the time of each blood pressure measurement is displayed in juxtaposition along with the time-axis 120 and the time-axis 124 parallel to it.

[0034] As mentioned above, according to this example, the pulse wave generated from the living body's artery in the process in which a living body's blood-pressure value is measured, synchronizing with a heartbeat is detected by the band pass filter 54. When the sequential storage of the configuration of the pulse wave detected with the band pass filter 54 is carried out by the pulse wave shape memory field 88 for every blood pressure measurement by step S5, by step S12 While the blood-pressure value memorized by the blood-pressure value storage region 87 is displayed according to the measurement sequence, the curve 122 showing the configuration of the pulse wave by which sequential storage was carried out in the pulse wave shape memory field 88 is displayed in juxtaposition according to the storage sequence, respectively. Therefore, since according to the equipment of this example the configuration of a pulse wave is displayed in the condition of having been arranged in juxtaposition by the blood-pressure-measurement actuation with, comparatively simple measurement and transition of change of the configuration of a pulse wave can grasp easily with transition of a blood-pressure value, decision of a heart disease is attained.

[0035] Moreover, according to this example, since it is not necessary to form independently the pulse wave sensor for detecting the configuration of a pulse wave since pressure vibration generated in said cuff 16 synchronizing with a living body's heartbeat for blood pressure measurement is detected as a pulse wave, the structure of equipment becomes simple and the band pass filter 54 which functions as said pulse wave detection means 94 has the advantage which can be constituted cheaply.

[0036] Moreover, in order to equalize the amplitude of the pulse wave configuration 122 displayed by the display means 98 according to this example, signal processing of the pulse wave memorized by the pulse wave shape memory field 88 is carried out so that the amplitude may become the same by step S10. Thereby, the comparison of a pulse wave configuration becomes easy and can grasp change of a pulse wave configuration easily.

[0037] Moreover, in order to equalize wavelength of the pulse wave 122 displayed by the above-mentioned display means 98 according to this example, signal processing of the pulse wave memorized by the pulse wave shape memory field 88 is carried out so that the wavelength may become the same by

step S11. Thereby, the comparison of a pulse wave configuration becomes still easier, and there is an advantage which can grasp change of a pulse wave configuration easily.

[0038] Moreover, according to this example, the wave description value of the pulse wave by which sequential storage was carried out in the pulse wave shape memory field 88 is computed by step S8. The wave description value of the pulse wave is memorized in the wave description value storage region 89, respectively, and the wave description value of the pulse wave by which sequential storage was carried out in the wave description value storage region 89 is displayed according to the calculation sequence of the wave description value of a pulse wave, i.e., the detection sequence of a pulse wave, in step S12. Thereby, a wave-like change is grasped quantitatively and change of a pulse wave configuration is grasped further easily.

[0039] Moreover, the blood-pressure value by which sequential storage was carried out [according to this example] in step S12 in the blood-pressure value storage region 87, While graphical representation of the wave description value of the pulse wave by which sequential storage was carried out in the wave description value storage region 89 is carried out along with a common time-axis 120 or common 124 Since the curve 122 showing the configuration of the pulse wave memorized by the pulse wave shape memory field 88 is displayed in juxtaposition along with the time-axis 120 common to the above, grasp of change of a pulse wave configuration becomes still easier.

[0040] Drawing 7 shows other examples of a display by said step S12. This example of a display is suitably used, when the width-of-face dimension of the recording paper used for a printer 26 is large, or when it changes to a printer 26 or a CRT display machine is formed in a printer 26 and juxtaposition. In drawing 7 , while the name 112 of an operating personnel-ed is displayed on the location at the upper left of a viewing area, the list 114 of measurement time, a blood-pressure value, and pulse rates is displayed on the bottom, and a sequential indication of the trend graph 116 and the pulse wave train 118 is given on the right-hand side of the list 114. Also in this trend graph 116, O mark which shows - mark which shows ** mark which shows the bar line which shows a highest-blood-pressure value and a lowest-blood-pressure value to a right end and each left end, and a pulse rate, and %MAP value, and a SLOPE value is displayed in accordance with the axis of ordinate 120, i.e., a time-axis, corresponding to the blood-pressure-measurement time. Moreover, in the above-mentioned pulse wave train 118, the configuration 122 of the pulse wave by which sequential storage was carried out is displayed in juxtaposition along with the time-axis 120 at the time of each blood pressure measurement. In addition, even if the above-mentioned time-axis 120 is not displayed, it should just exist substantially.

[0041] Drawing 8 shows the example of a display of further others by said step S12. In drawing, while the name 112 of an operating personnel-ed is displayed on the location at the upper left of a viewing area, the list 114 of an assay date, a blood-pressure value, and pulse rates is displayed on the bottom, and a sequential indication of the trend graph 116, the pulse wave train 118, and the medication agent name 126 is given on the right-hand side of the list 114. Also in this trend graph 116, O mark which shows the bar line which shows a highest-blood-pressure value and a lowest-blood-pressure value to a right end and a left end, respectively, and a pulse rate is displayed in accordance with the axis of ordinate 120, i.e., a time-axis, corresponding to the blood-pressure-measurement time. Moreover, the above-mentioned pulse wave train 118 is displayed in juxtaposition along with the above-mentioned time-axis 120 in the grid-like frame 128 with which the configuration 122 of the pulse wave by which sequential storage was carried out at the time of each blood pressure measurement contains a time-axis 124. Moreover, drugs names, such as a hypotensor with which a medicine was prescribed for the medication agent name 126 at the time of each blood pressure measurement, are displayed in juxtaposition along with the time-axis 120. This medication agent name 126 is inputted into a control unit 56, for example in advance of startup actuation of said step S4 by transmission of the signal from the host computer which manages actuation of the keyboard which is connected to automatic blood-pressure-measurement equipment 8, and which is not illustrated, and medical information etc.

[0042] According to the above-mentioned example of a display, since the medication agent name 126 is displayed with the trend graph 116 and the pulse wave train 118, it becomes possible to get to know the effectiveness of a medication agent serially on the occasion of the therapy of a heart disease. In addition,

although the grid-like frame 128 with which the above-mentioned pulse wave train 118 is displayed is for making change of a pulse wave much more legible, even if not displayed especially, it does not interfere. Moreover, the figure which shows the pulse in a list 114 is made smaller than the figure which shows a blood-pressure value, and although misreading with a blood-pressure value is made hard to produce, even if displayed in the same magnitude as the figure which shows a blood-pressure value, it does not interfere.

[0043] As mentioned above, although one example of this invention was explained based on the drawing, this invention is applied also in other modes.

[0044] For example, in the above-mentioned example, step S8 thru/or a part or all of S11 does not necessarily need to be prepared.

[0045] Moreover, in the above-mentioned example, step S10 thru/or S11 may be constituted so that it may perform in front of step S7. In such a case, the configuration of a pulse wave where amplitude processing and wavelength processing were performed will be memorized to the pulse wave shape memory field 88.

[0046] Moreover, in the above-mentioned example, although the blood-pressure value was determined according to the so-called oscillograph metric method at step S5, a blood-pressure value may be determined according to a Korotkoff-sounds method. In such a case, the microphone for detecting Korotkoff sounds is formed.

[0047] Moreover, although the automatic blood-pressure-measurement equipment 8 of the above-mentioned example was constituted so that blood pressure measurement might be started a condition [the magnetic card 76 having been inserted], a cuff 16 may be blood-pressure-measurement equipment of the form which was beforehand determined in the patient's blood-pressure value in the condition of having been twisted around the predetermined patient and which repeats measurement continuously, for example with 5 thru/or the period of about 30 minutes. In such a case, a blood-pressure value and the wave configuration 122 are displayed for every measurement cycle along with a time-axis 120.

[0048] In addition, having mentioned above is one example of this invention to the last, and modification may be variously added in the range in which this invention does not deviate from the main point.

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] It has a blood-pressure-measurement means to measure a living body's blood-pressure value, and a blood-pressure value storage means to memorize serially the blood-pressure value measured by this blood-pressure-measurement means. In the process in which are blood-pressure-measurement equipment which outputs the blood-pressure value memorized serially to this blood-pressure value storage means, and a living body's blood-pressure value is measured by said blood-pressure-measurement means A pulse wave detection means to detect the pulse wave generated from this living body's artery synchronizing with a heartbeat, While displaying the blood-pressure value memorized by the pulse wave shape memory means which carries out the sequential storage of the configuration of the pulse wave detected by this pulse wave detection means for every blood pressure measurement by said blood-pressure-measurement means, and said blood-pressure value storage means according to the measurement sequence Blood-pressure-measurement equipment characterized by including a display means to display in juxtaposition the curve showing the configuration of the pulse wave by which sequential storage was carried out with said pulse wave shape memory means according to the storage sequence, respectively.
[Claim 2] Said pulse wave detection means is blood-pressure-measurement equipment of claim 1 which is what detects pressure vibration generated synchronizing with a heartbeat in the cuff wound around a living body in order that said blood-pressure-measurement means may measure a blood-pressure value as a pulse wave.
[Claim 3] Blood-pressure-measurement equipment of claim 1 which is a thing including an amplitude processing means to perform signal processing so that the amplitude may become the same about the pulse wave memorized by said pulse wave shape memory means, in order to equalize the amplitude of the pulse wave displayed by said display means.
[Claim 4] Blood-pressure-measurement equipment of claim 1 which is a thing including a wavelength processing means to perform signal processing so that the wavelength may become the same about the pulse wave memorized by said pulse wave shape memory means, in order to equalize wavelength of the pulse wave displayed by said display means.
[Claim 5] Blood-pressure-measurement equipment of claim 3 which is a thing including a wavelength processing means to perform signal processing so that the wavelength may become the same about the pulse wave memorized by said pulse wave shape memory means, in order to equalize wavelength of the pulse wave displayed by said display means.
[Claim 6] It is blood-pressure-measurement equipment of claim 1 which is equipped with a wave description value calculation means compute the wave description value of the pulse wave by which sequential storage was carried out with said pulse-wave shape-memory means, and the wave description value storage means which carry out the sequential storage of the wave description value of this pulse wave, and displays the wave description value of the pulse wave by which the sequential storage of said display means was carried out with this wave description value storage means according to the detection sequence of the pulse wave.

[Claim 7] Said display means is blood-pressure-measurement equipment of claim 6 which displays in juxtaposition the curve which expresses the configuration of the pulse wave memorized by said pulse-wave shape-memory means while carrying out graphical representation of the blood-pressure value memorized by said blood-pressure value storage means, respectively, and the wave description value of the pulse wave memorized by said wave description value storage means, respectively along with a common time-axis along with a time-axis common to the above.

[Translation done.]

* NOTICES *

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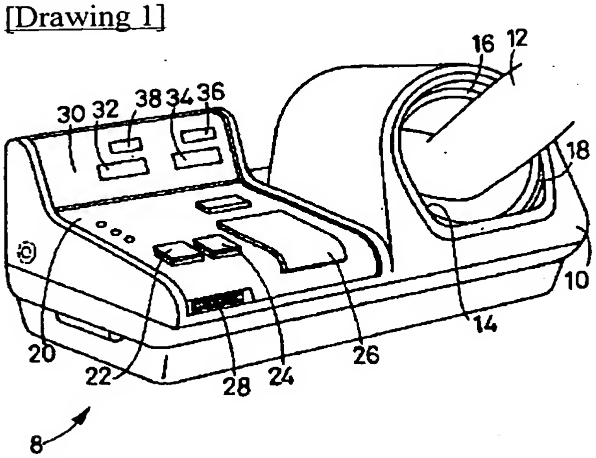
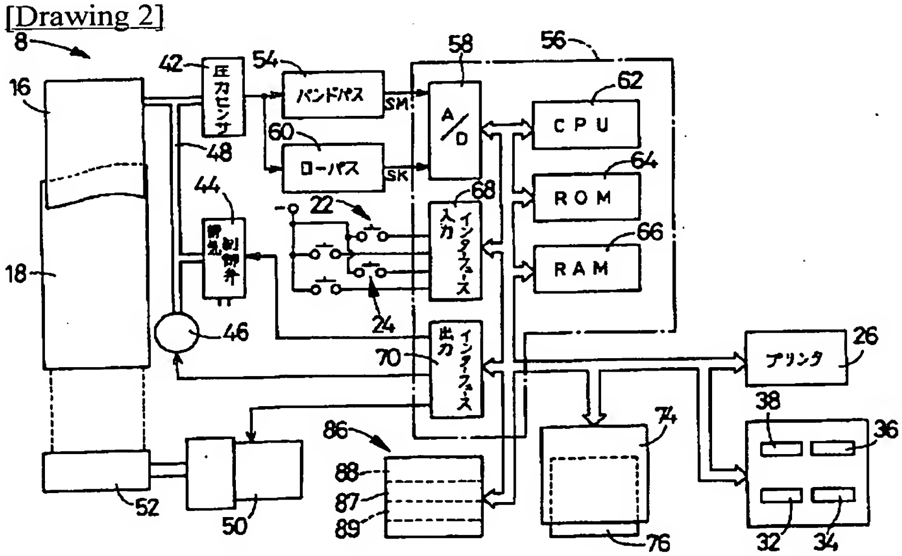
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

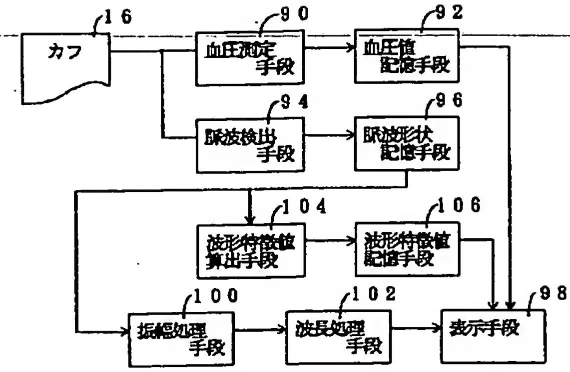
[Drawing 1]



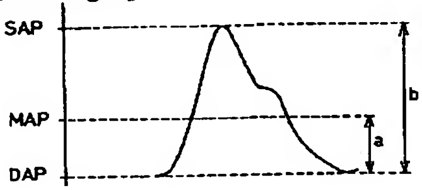
[Drawing 2]



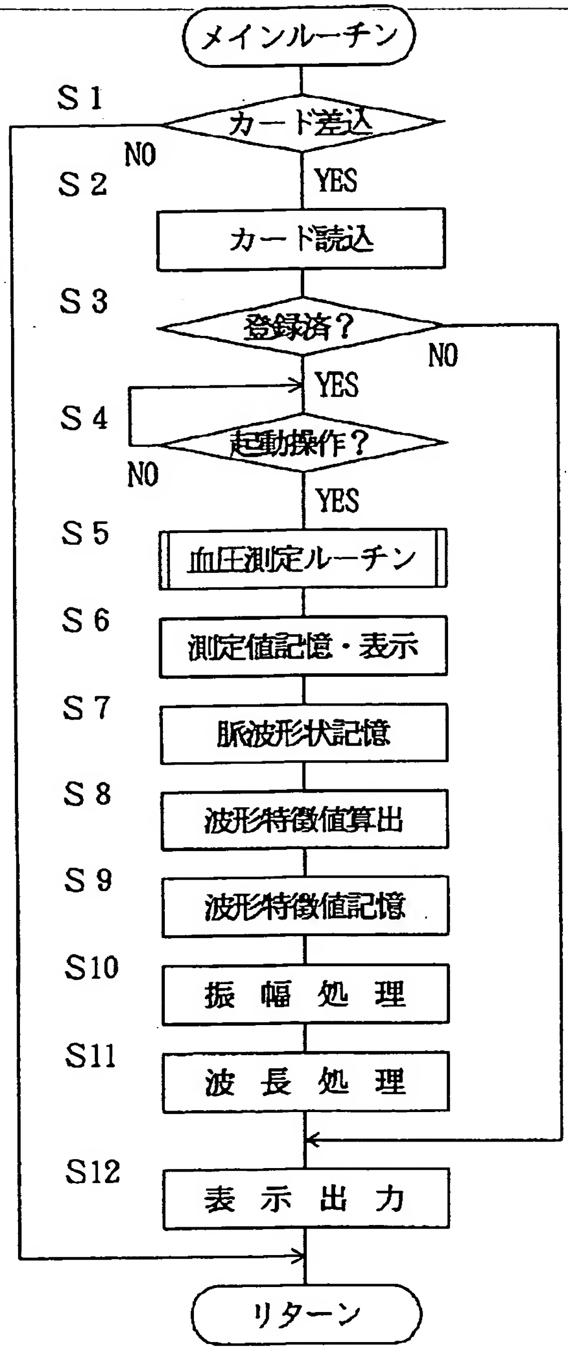
[Drawing 3]



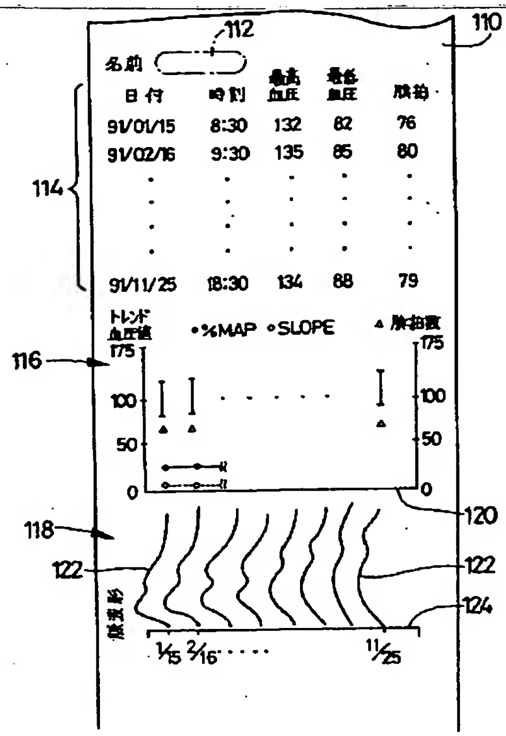
[Drawing 5]



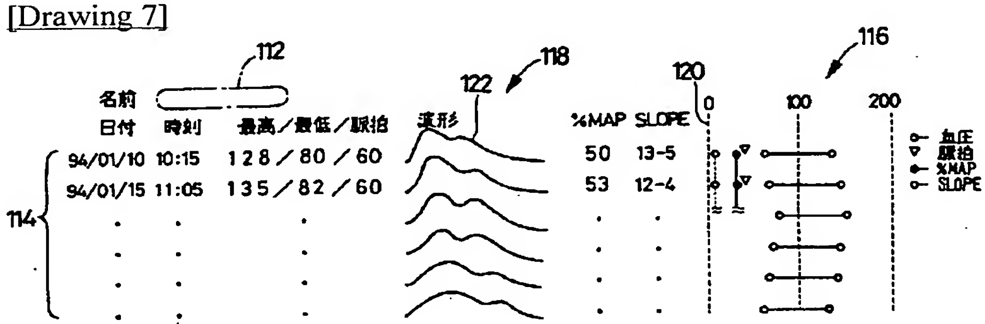
[Drawing 4]


メインルーチン
S 1
カード差込
NO
YES
S 2
カード読込
S 3
登録済？
NO
YES
S 4
起動操作？
NO
YES
S 5
血圧測定ルーチン
S 6
測定値記憶・表示
S 7
脈波形状記憶
S 8
波形特徴値算出
S 9
波形特徴値記憶
S10
振 幅 処 理
S11
波 長 処 理
S12
表 示 出 力
リターン

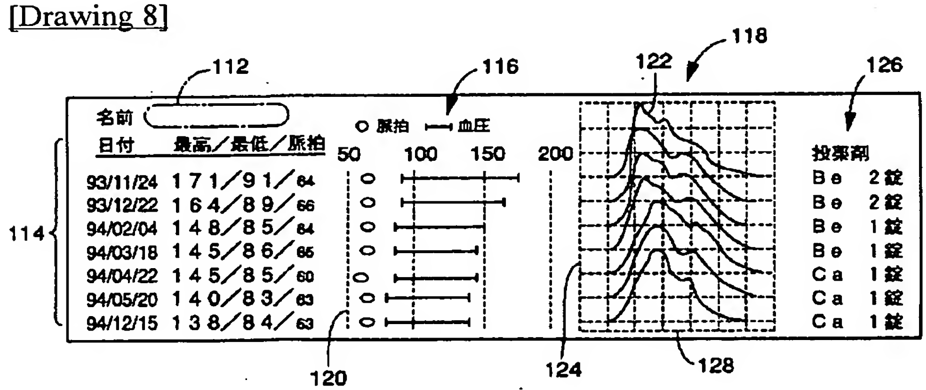
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]